Space Weather Forecast

Issued on Monday, 04 December 2023 at 13:28 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1-G2 (Minor-Moderate geomagnetic storms) likely day 1 and 2 (04-05 Dec). Chance of isolated Moderate Class flares (R1-R2 Blackouts) days 1 and 2 (04-05 Dec).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is Low with the largest flare of the past 24 hours a C-class flare at 04/0126 UTC from AR3511. There are nine sunspot regions on the disc. One in the southwest approaching the limb, has been largely inactive recently and continues a slowly decay. Two smaller regions in the southeastern quadrant approaching centre disk continue to emerge, with the southernmost becoming magnetically complex recently and also responsible for the aforementioned high-level C-class flare early on 04 Dec. The remaining regions on the visible disc are mature and stable.

Despite a number of coronal mass ejection signatures evidenced in coronagraph imagery during the past 24 hours, none are considered Earth-directed. A recent filament that erupted in the southeast around 03/07000 UTC has given a coronal mass ejection, however, further analysis of solar imagery is required to confirm the direction and size.

Solar Wind / Geomagnetic Activity: Solar wind parameters have been indicative of the steady arrival of a coronal hole high-speed stream. Solar wind speeds rose from slightly elevated to elevated levels. The Interplanetary Magnetic Field was initially weak before rising to moderate levels after 04/0500 UTC. The north-south component of the IMF (Bz), was largely positive with only brief spells at negative. Resultant Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) persisted at Background levels with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Low with a chance for isolated Moderate-class flares (R1-R2 Blackouts) on days 1-2 (04-05 Dec), reducing to a slight chance on days 3-4 (06-07 Dec).

Solar Winds / Geomagnetic Activity: A coronal mass ejection that left the sun on 01 Dec is expected to give a glancing blow at Earth late day 1 (04 Dec) or early day 2 (05 Dec). No further coronal mass ejections are currently thought to be Earth-directed. Solar winds have increased to Elevated levels, with Strong winds expected as the coronal hole fast winds continue to arrive during days 1 and 2 (04 and 05 Dec). Strong or Elevated speeds may persist through into day 3 (06 Dec) before slowly easing to Slightly Elevated levels by day 4 (07 Dec).

Geomagnetic activity is expected to be Quiet to Unsettled, then forecast to increase to G1-G2/Minor-Moderate Storm (Kp 5-6) levels later day 1 (04 Dec) and early day 2 (05 Dec). Following peak geomagnetic activity, indices should fall to Unsettled to Active by the end of day 2 (05 Dec), before becoming Quiet to Unsettled from day 3 (06 Dec) onwards.

Aurora: Auroral activity is expected to become enhanced day 1 or 2 (04 or 05 Dec), when the onset of faster solar winds are expected at Earth. From the UK views of aurora may be possible

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from as far south as Northern England and Northern Ireland on Monday night where skies are clear, with a diminishing risk on subsequent days as geomagnetic activity reduces.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to remain at background levels with no Solar Radiation Storms expected.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	60	60	5	1
Strong	G3	No	5	5	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	40	30	15	15
Very Active	R3 to R5 X	No	5	3	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	5	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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